

CLAIMS

1. A highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability, having on the steel product surface a zinc alloy plating layer composed of 4 to 10% by mass of Al, 1 to 5% by mass of Mg, up to 0.1% by mass of Ti and the balance of Zn and unavoidable impurities, the plating layer having a metal structure in which one or at least two of the [Al phase], [Zn<sub>2</sub>Mg phase] and [Zn phase] are present in a mixture in the matrix of an [Al/Zn/Zn<sub>2</sub>Mg ternary eutectic structure], and the plating layer containing a Ti-Al base intermetallic compound in one or at least two of the [Al phase], [Zn<sub>2</sub>Mg phase] and [Zn phase].
2. A highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability, having on the steel product surface a zinc alloy plating layer composed of 4 to 22% by mass of Al, 1 to 5% by mass of Mg, up to 0.1% by mass of Ti, up to 0.5% by mass of Si and the balance of Zn and unavoidable impurities, the plating layer of the plated steel product having a metal structure in which an [Mg<sub>2</sub>Si phase], an [Al phase] and a [Zn<sub>2</sub>Mg phase] are present in a mixture in the matrix of an [Al/Zn/Zn<sub>2</sub>Mg ternary eutectic structure], and the plating layer containing a Ti-Al base intermetallic compound in one or at least two of the [Al phase] and [Zn<sub>2</sub>Mg phase].
3. A highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability, having on the steel product surface a zinc alloy plating layer composed of 4 to 22% by mass of Al, 1 to 5% by mass of Mg, up to 0.1% by mass of Ti, up to 0.5% by mass of Si and the balance of Zn and unavoidable impurities, the plating layer of the plated steel product having a metal structure in which an [Mg<sub>2</sub>Si phase], an [Al phase], a [Zn<sub>2</sub>Mg phase] and a [Zn phase] are present in a mixture in the matrix of an [Al/Zn/Zn<sub>2</sub>Mg ternary eutectic

structure], and the plating layer containing a Ti-Al base intermetallic compound in one or at least two of the [Al phase], [Zn<sub>2</sub>Mg phase] and [Zn phase].

5        4.    A highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability, having on the steel product surface a zinc alloy plating layer composed of 4 to 22% by mass of Al, 1 to 5% by mass of Mg, up to 0.1% by mass of Ti, up to 0.5% by mass of Si and the balance of Zn and unavoidable  
10       impurities, the plating layer of the plated steel product having a metal structure in which an [Mg<sub>2</sub>Si phase], an [Al phase] and a [Zn phase] are present in a mixture in the matrix of an [Al/Zn/Zn<sub>2</sub>Mg ternary eutectic structure], and the plating layer containing a Ti-Al base intermetallic  
15       compound in one or two of the [Al phase] and [Zn phase].

5.    A highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability, wherein the Ti-Al base intermetallic compound according to any one of claims 1 to 4 is TiAl<sub>3</sub>.

20       6.    A highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability, wherein the Ti-Al base intermetallic compound according to any one of claims 1 to 4 is Ti(Al<sub>1-x</sub>Si<sub>x</sub>)<sub>3</sub> (wherein X = 0 to 0.5).

25       7.    The highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability according to any one of claims 1 to 6, wherein the Ti-Al base intermetallic compound contained in an [Al phase] in the plating layer is present in a Zn-Al eutectoid reaction structure in which Zn phases are  
30       condensed.

8.    The highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability according to any one of claims 1 to 7,  
35       wherein the size of a dendrite in an [Al phase] in the plating layer is up to 500 μm.

9.    A process for producing the highly corrosion-

resistant hot-dip galvanized steel product excellent in surface smoothness and formability according to any one of claims 1 to 8, comprising the step of adding a Ti-Zn base intermetallic compound to a plating bath.